

# THE RE-INSTATEMENT OF *BORRERIA* *TERMINALIS* SMALL (RUBIACEAE)

ALAN HERNDON

*South Florida Research Center, Everglades National Park  
Homestead, FL 33030, U.S.A.*

## ABSTRACT

Populations of *Borreria terminalis* Small and *B. verticillata* (L.) G.E.W. Meyer in southern Florida were studied to determine whether the recent reduction of the former to the synonymy of the latter was justified. Vegetative characters were found to distinguish populations but provided no means of separating the species. Marked differences were found between the species in several characters related to flower size. The consistency of the floral differences and the absence of hybrids supported the continued recognition of *B. terminalis* as a distinct species endemic to southern Florida.

John Blodgett collected specimens of a *Borreria* on Big Pine Key, Monroe Co., Florida in the middle part of the 19th century which Chapman (1860) referred to *B. podocephala* DC. var. *pumila* Chapman. This treatment at first was accepted by Small (1913), but he later described the plant as a new species, *B. terminalis* Small (1924). Small differentiated *B. terminalis* from the closely related *B. verticillata* on the basis of flower size. *Borreria terminalis* was listed as endemic to southern Florida in Small's Manual of the Vascular Flora of the Southeastern United States (1933) while *B. verticillata* was not listed as occurring in the area at all. Plants referred to *B. verticillata* were first recorded in southern Florida as a weed introduced into Dade County during the late 1960's. Wunderlin (1979), reviewing *Borreria* (as *Spermacoce*) in Florida, relegated *B. terminalis* to the synonymy of *B. verticillata* without elaboration. Quite apparent differences between the populations referred to *B. terminalis* and *B. verticillata* in Dade County however, indicated the need for further study.

For the last several decades, the name *B. terminalis* Small has been applied to a plant which grows in sites ranging from dry pineland to prairies with a short hydroperiod throughout southern Florida. This plant is most abundant and grows most luxuriantly in areas which are flooded for short periods (1 to 2 months) yearly. The weedy plants referred to *B. verticillata* are clearly a recent introduction to southern Florida. Their distribution is generally sympatric with that of *B. terminalis* in Florida, but they show a preference for drier sites. They grow primarily along road shoulders and in disturbed fields which rarely if ever are flooded.



Road shoulder populations of this plant are often found adjacent to populations of *B. terminalis*. Other populations of plants in this complex are found in Palm Beach and Martin counties, isolated from the two population groups previously mentioned, growing along road shoulders in wet areas. This population was treated as an element of *B. terminalis* by Long and Lakela (1971).

Collections were made from several populations of plants belonging to this complex in southern Florida (Figure 1). Total flower length (ovary plus corolla), ovary length, ovary width, and width of the corolla limb were measured on fresh flowers. Figure 2 shows flowers from the two species and illustrates how measurements were made. Leaf length and width, ovary length and width, length of corolla tube, and seed length (along the long axis) were measured on dried specimens collected during this study or examined in the herbaria of Everglades National Park (ENP) and Fairchild Tropical Garden (FTG).

Three distinct morphological types were recognized among the collected plants. **Group A**, which represents *B. terminalis* as traditionally recognized, is characterized by linear to lanceolate-linear leaves, little-branched habit, and large flowers. The corolla limb of plants belonging to this type is 2.5 mm or more wide. **Group B**, representing the newly introduced weed, is characterized by relatively broad, elliptic leaves, much-branched habit, and small flowers. The corolla limb on plants of this type is 1.4–2.0 mm wide. Plants of **Group C**, from Palm Beach and Martin counties, have long, linear leaves of **Group A** plants and the small flowers of **Group B** plants. All of the groups are identical with respect to seed length (Figure 3).

The populations sampled during this study fall into two groups when ovary length and corolla limb width are considered (Figure 4), even though a large amount of variation is found in both ovary length and corolla limb width within each population. Most of this intrapopulation variation is due to the progressive reduction in size of flowers developed towards the distal end of the inflorescence branches. Plants of **Group A** are clearly separated from plants of **B** and **C**, while the latter two are totally mixed together. It is possible to separate **Group A** from **B** and **C** on the basis of corolla limb width alone (Figure 5) with considerable accuracy. Differences in corolla size are evident on dried specimens, and are very useful in distinguishing plants of **Group A** from plants of **Group C**.

**Group B** is sharply distinguished from the sympatric **Group A** in leaf shape (Figure 6) as well as flower size. These plants have been growing in close proximity for at least two decades, but no evidence of crossing between any populations has been found. This, and the magnitude of the



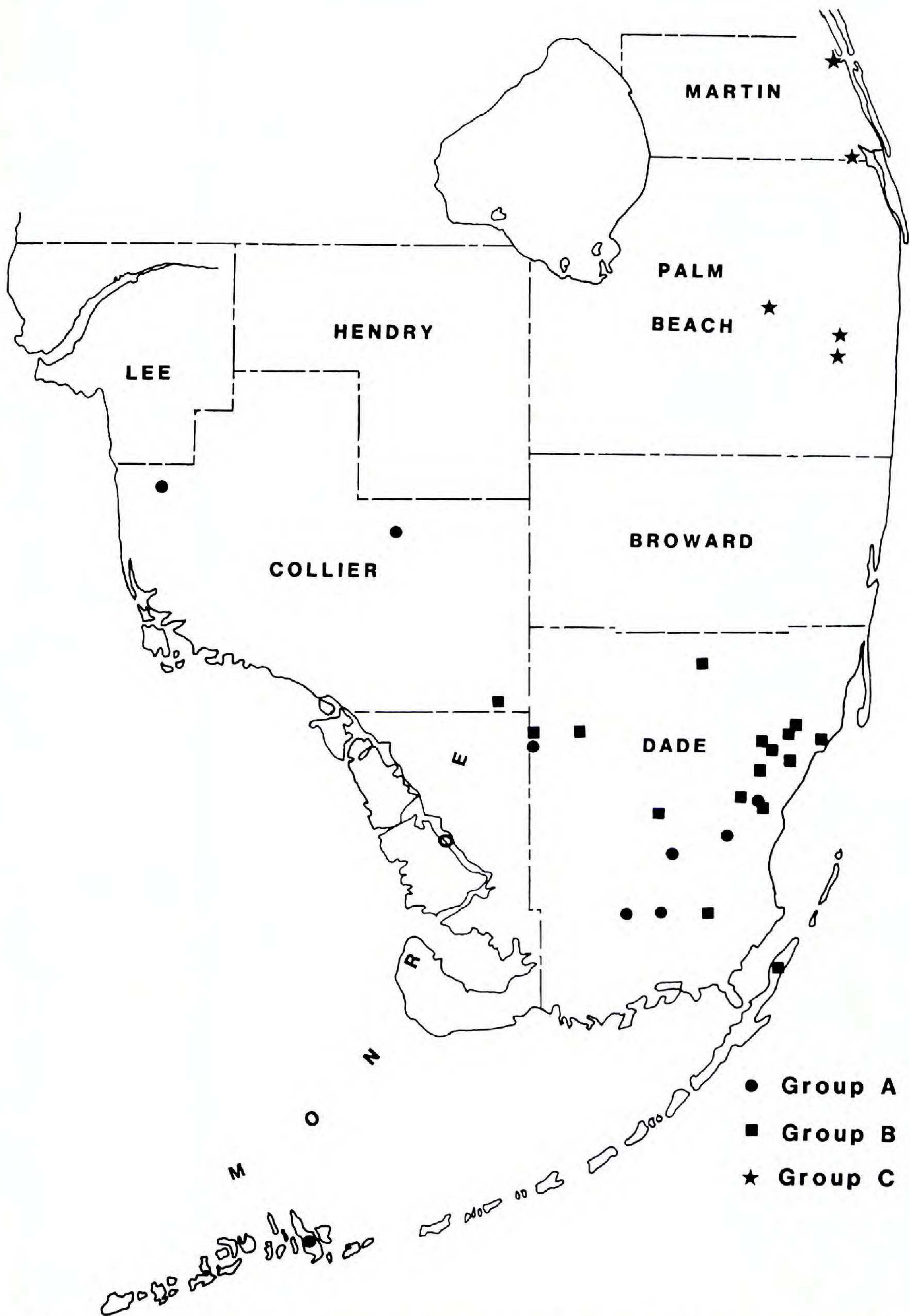


Figure 1. Collection localities of specimens examined during this study. Differences between groups are detailed in the text.



difference in flower size, supports the recognition of two groups as distinct species. Small did not designate a type specimen in his original description of *B. terminalis*, but F.R. Fosberg at the United States National Herbarium has graciously examined early collections of *Borreria* from southern Florida and confirmed that Small's concept of the species was based on the large-flowered plants of **Group A** (pers. comm.).

Plants of **Group C** are not sufficiently distinct from plants of **Group B** to warrant taxonomic recognition. The two groups appear to represent different elements of the widespread and troublesome *B. verticillata-capitata* complex. Plants in **Group B** are identical to plants called *B. verticillata* by Correll & Correll (1982), but as Fosberg (pers. comm.) points out, *B. verticillata* has not been typified, so the correct application of this name is still in doubt.

In addition to differences in overall flower size, *B. terminalis* has larger anthers and larger pollen grains when compared to the other populations. These differences are correlated with flower size and may be due to the reported polyploidy of *B. terminalis* ( $2n = 84$ , Lewis 1962), a triploid relative to *B. verticillata* ( $2n = 28$ , Miede 1962; Lewis et al. 1966).

Using the name *B. verticillata* for the small-flowered plants of **Groups B** and **C** (with the reservations noted above), we may delineate the species as follows:

Corolla tube 1.25 – 2.5 mm long; ovaries of larger flowers over 1.5 mm long, 1.0 mm wide; leaves linear, 2 – 5 cm long, 0.15 – 0.4 cm wide . . . . .	<i>B. terminalis</i>
Corolla tube 0.6 – 1.0 mm long; ovaries of larger flowers usually under 1.5 mm long, 0.7 mm wide; leaves linear to elliptic, 1 – 5 cm long, 0.2 – 0.8 cm wide . . . . .	" <i>B. verticillata</i> "

*BORRERIA TERMINALIS* Small, Bull. Torrey Bot. Club 51:387. 1924.

*Borreria podoccephala* DC. var. *pumila* Chapman, Fl. Southern U.S. 175. 1860.

#### Specimens examined (**Group A**):

FLORIDA. Collier Co.: roadside, Alligator Alley, 30 May 1979, *Black & Black* 384 (ENP, FTG); in dry scattered-pine savanna along Route 839, E of Jerome, 12 May 1981, *Correll* 51768 (FTG). Dade Co.: open pineland in pitted limestone, W of Old Cutler Road, just S of Cutler Hammock and canal, 15 Sept 1973, *Correll & Correll* 40047 (FTG); in periodically wet area in open pineland near fire tower on road running SW of road to Anhinga Trail, Everglades National Park, 29 Dec 1973, *Correll & Long* 40970 (FTG); park entrance, Everglades National Park, 19 Dec 1955, *Craighead s.n.* (ENP); burned-over pineland, Seminole Wayside Park, 21 Nov 1972, *Gillis* 11504 (FTG); rocky pineland with red soil, SW 272 St-152 Ave, 22 Feb 1983, *Herndon* 682 (FTG); low, rocky pineland, near gate 4, Block E, Long Pine Key, Everglades National Park, 26 Feb 1983, *Herndon* 686 (FLAS, FTG); rocky pineland with sandy soil, SW 115 Ave-163 St, 6 Mar 1983, *Herndon* 697 (FTG); short saw grass prairie off Context Road, approx. 2.5 km W of L31, 12 Mar 1983, *Herndon* 699 (FTG, US); pinelands at entrance to Everglades National Park, on US



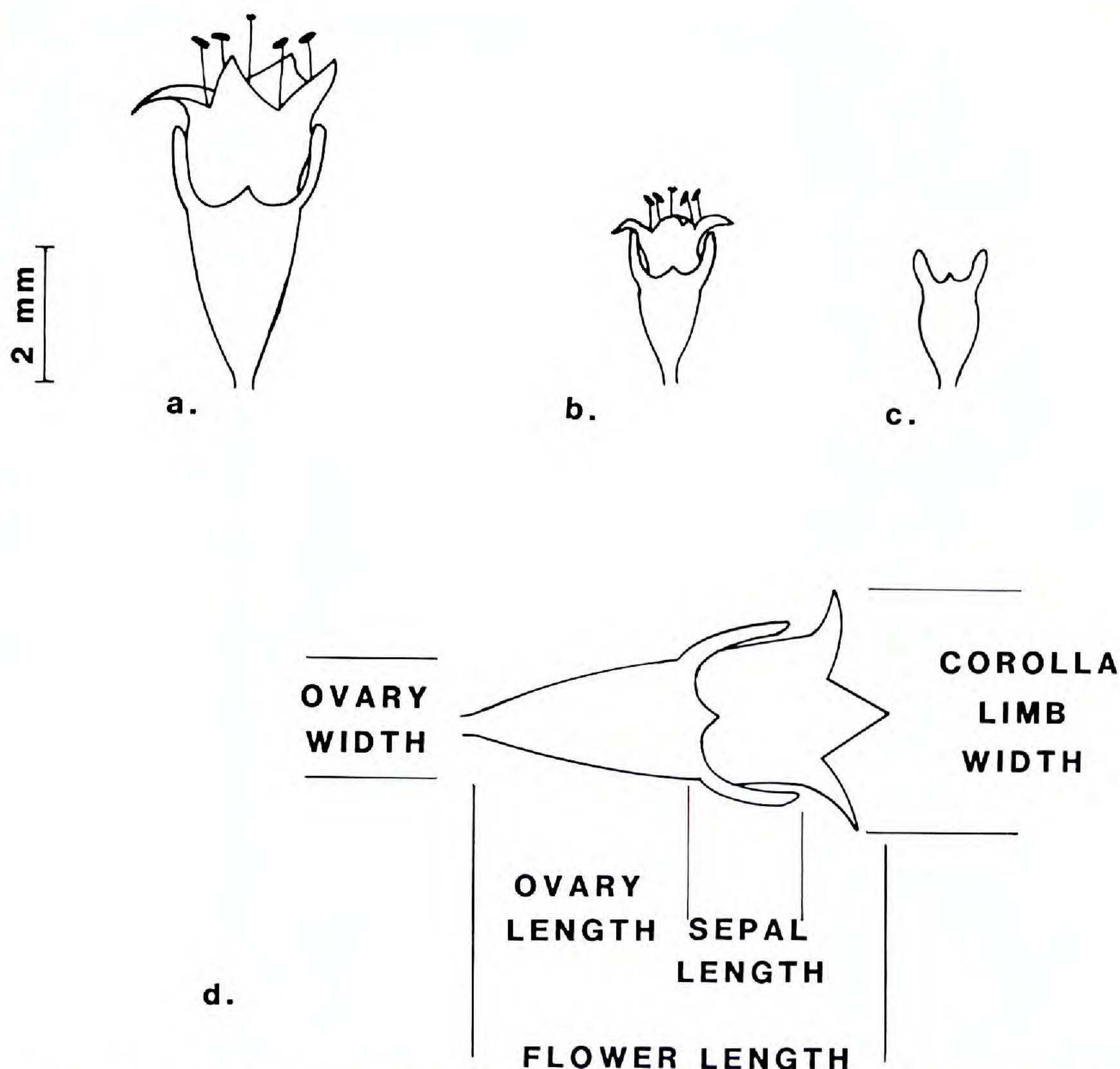


Figure 2. a) Flower of *Borreria terminalis* at anthesis. b) Flower of *B. verticillata* at anthesis. c) Mature fruits of *B. verticillata*. d) Diagram illustrating the measurements taken from fresh flowers.

27, 23 Oct 1983, *Herndon* 949 (FLAS, FTG, RSA, US); pinelands just W of Glade 2, Long Pine Key, Everglades National Park, 6 Nov 1983, *Herndon* 964 (FLAS, FTG, US); rocky grassland, S side of 216 St., 7.4 mi SW of intersection with 194 Ave, W of Goulds, 12 Mar 1975, *Hill & Popenoe* 2570 (FTG); edge of citrus grove just W of Homestead General Aviation Airport, 5 Feb 1978, *Popenoe* 1160 (FTG); Long Pine Key, Everglades National Park, 3 Apr 1952, *Robertson s.n.* (ENP); pineland, on new burn, Long Pine Key, Everglades National Park, 17 Apr 1952, *Robertson s.n.* (ENP); high pinelands, Block J, Long Pine Key, Everglades National Park, 11 May 1964, *Sullivan* 28 (ENP). **Monroe Co.:** in savanna-like area, Big Pine Key, 8 Feb 1977, *Correll & Popenoe* 48080 (FTG).

Grows in pinelands and prairies. Known only from Collier, Dade, and Monroe counties, Florida.

**BORRERIA VERTICILLATA** (L.) G.F.W. Meyer, Prim. Fl. Esseq. 83. 1818.  
*Spermacoce verticillata* L., Sp. Pl. 102. 1753.



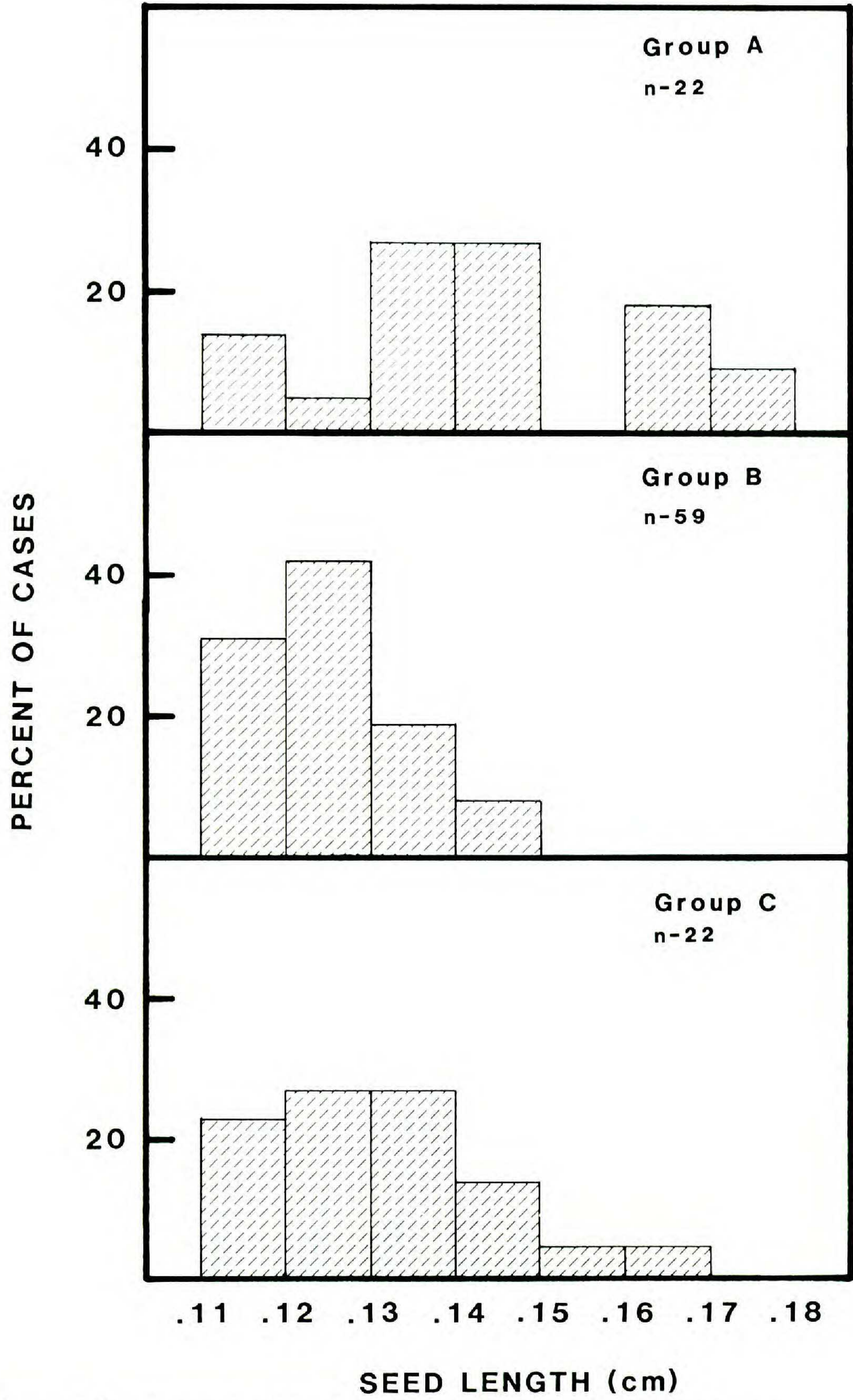


Figure 3. Distribution of seed lengths in the three morphological groups of *Borreria*.



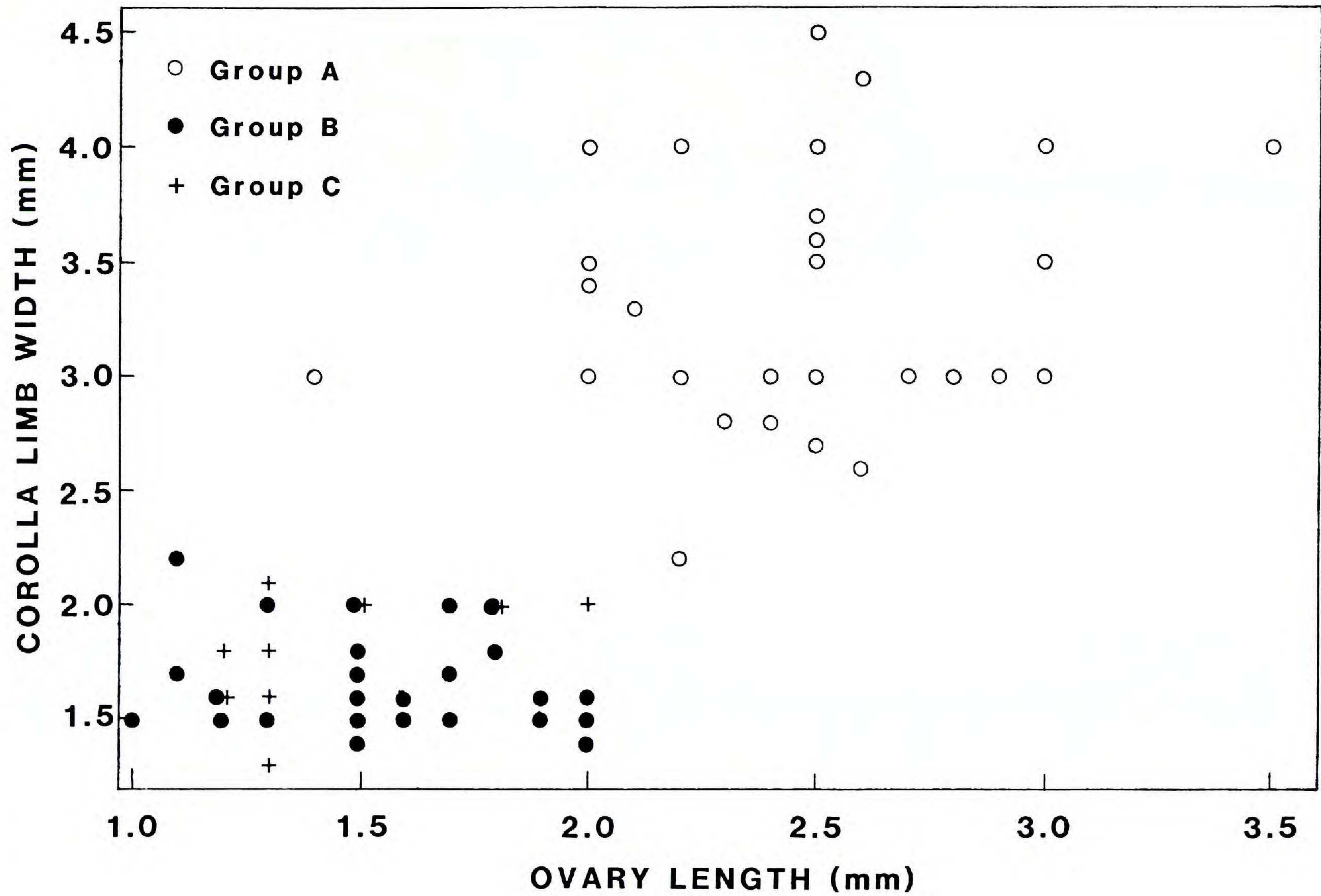


Figure 4. Scatter diagram of corolla disk width and ovary length from fresh flowers in the three morphological groups of *Borreria*.



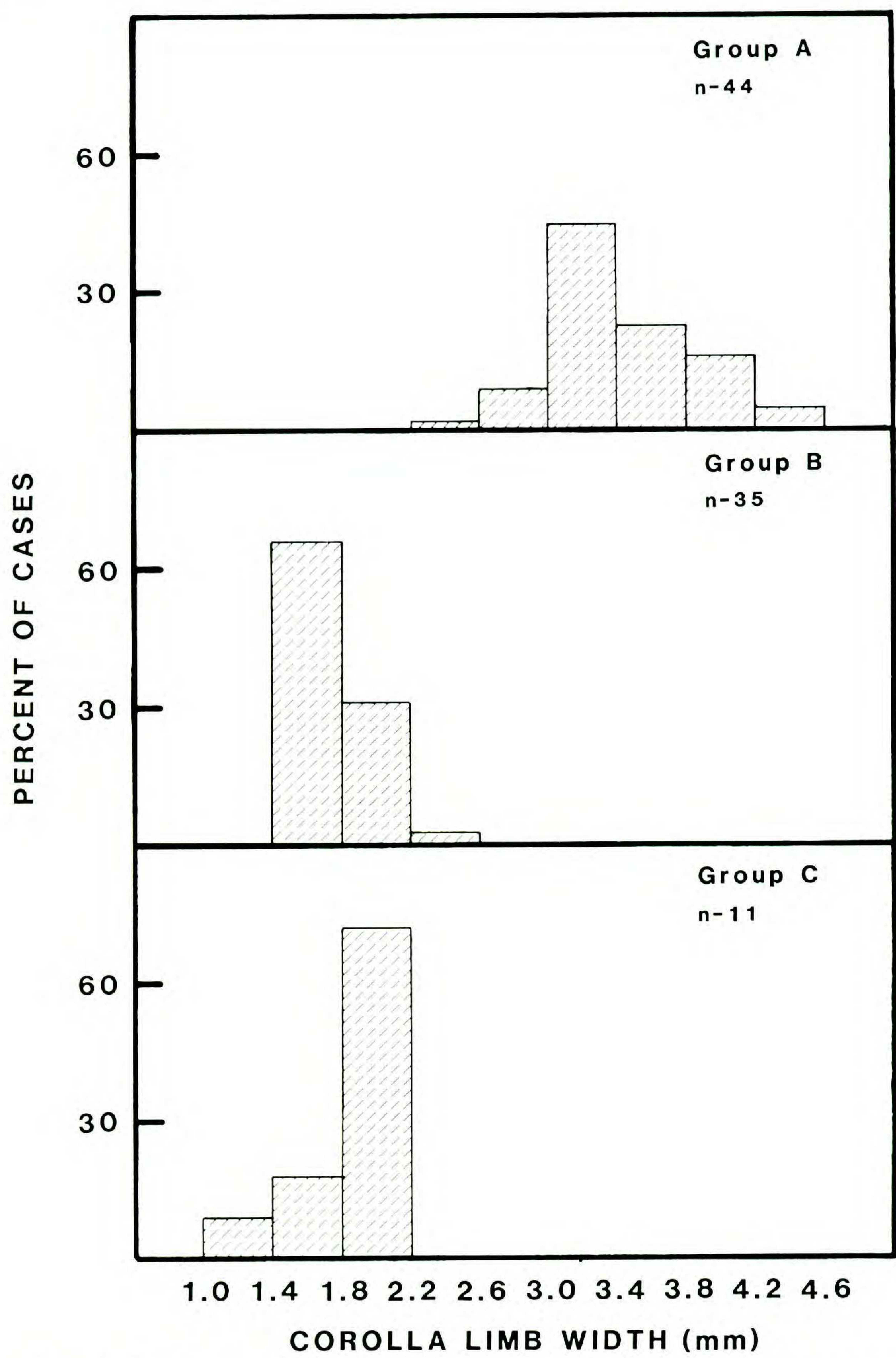


Figure 5. Distribution of corolla limb widths in the three morphological groups of *Borreria* (measurements from fresh flowers).



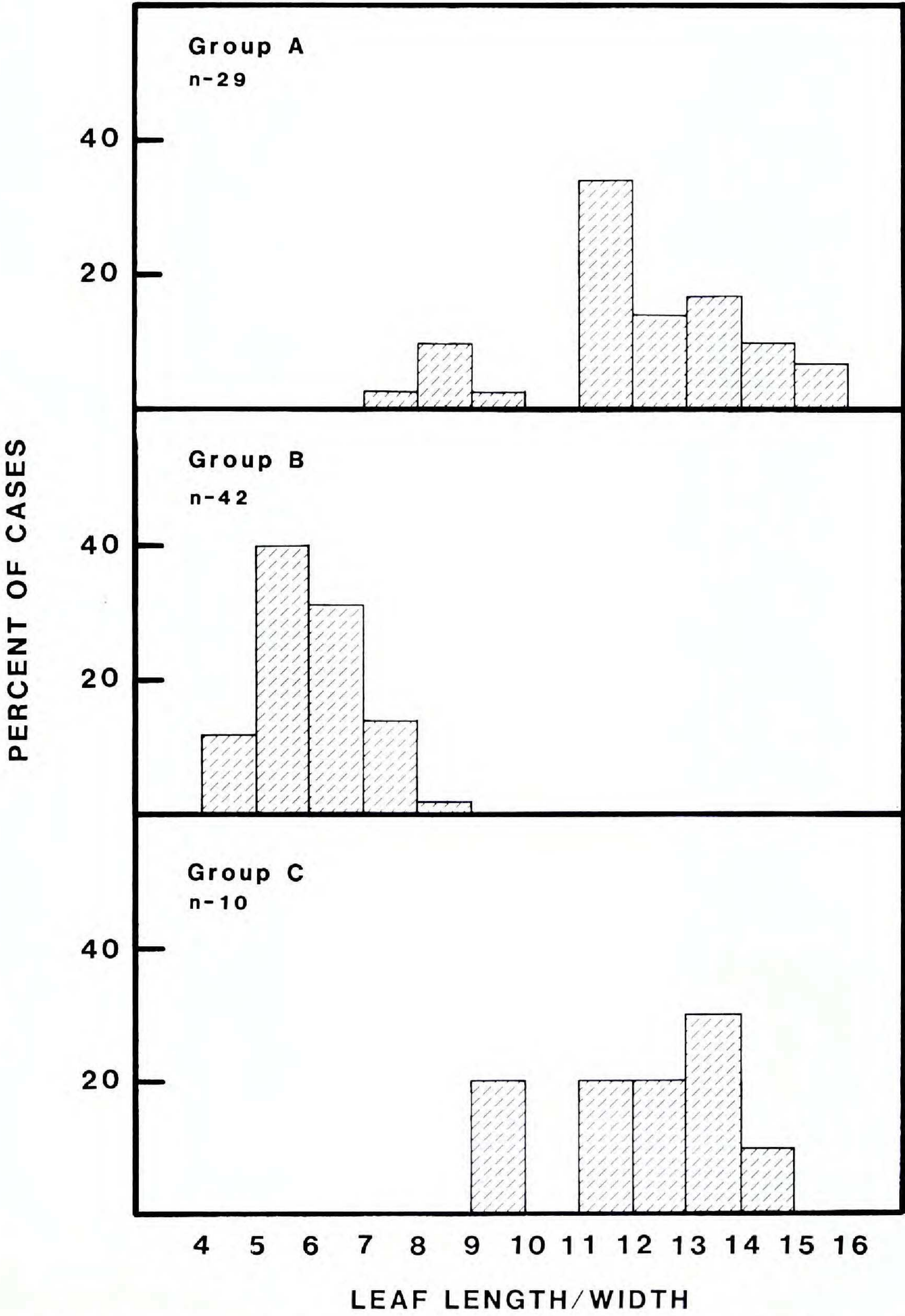


Figure 6. Distribution of the leaf length/width ratios in each of the three morphological groups of *Borreria* (measurements from dried specimens.)



### Specimens examined (Group B):

FLORIDA. Collier Co.: lawn of house, Fifty-mile bend, US 41, 28 Jan 1979, *Herndon* 122 (FTG). Dade Co.: on filled, vacant land, Red Road and canal S of Miami International Airport, 5 Feb 1969, *Avery* 589A (FTG); South Miami, disturbed soil in railroad right-of-way, SW 62 Ave & US 1, 8 Jul 1974, *Avery* 1502 (FTG); weed in lawn, SW 160 St-107 Ave, 4 Mar 1979, *Herndon* 173 (FTG); growing in mowed lawn beneath chain-link fence, SW 160 St-108 Ave, 2 Mar 1980, *Herndon* 327 (FLAS, FTG, RSA, US); weed in parking area, Miccosukee Restaurant, US 41, 18 mi W of SR 27, 21 Nov 1982, *Herndon* 666 (FTG, US); mowed field, Tamiami Campus, Florida International University, 21 Feb 1983, *Herndon* 681 (FTG, US); roadside, near Lake Chekika State Recreation Area, 5 Mar 1983, *Herndon* 690 (FTG, US); disturbed soil at the edge of a small hammock, Bird Drive Park, SW 40 St-72 Ave, 13 Mar 1983, *Herndon* 701 (FLAS, FTG); weed in parking lot, Colonial Drive Elementary School, SW 160 St-109 Ave, 19 Dec 1983, *Herndon* 994 (FLAS, FTG, RSA); disturbed road shoulder, SW 117 Ave-88 St, 9 Feb 1984, *Herndon* 1021 (FLAS, FTG); disturbed roadside, SW 152 St-137 Ave, 14 Feb 1984, *Herndon* 1026 (FTG); mowed lawn around parking lot, SW 12 St-13 Ave, Miami, 2 Apr 1984, *Herndon* 1047 (FLAS, FTG); on dry road shoulder, SR 27, 4 mi S of intersection with US 27, 28 May 1984, *Herndon* 1073 (FLAS, FTG, US); wayside rest area, intersection SR 41 & 94, 27 Mar 1975, *Hill* 2662 (FTG); Miami International Airport, Plant Inspection Station, 27 Nov 1968, *Popenoe* s.n. (FTG). Monroe Co.: on dry road shoulder, intersection Card Sound Road and SR 905, Key Largo, 6 May 1984, *Herndon* 1058 (FTG, US).

Introduced into Dade County, Florida ca 1967. Rapidly spreading at the present time with populations known along road shoulders from northern Key Largo in Monroe Co. through Highlands Co., Florida.

### Specimens examined (Group C):

FLORIDA. Martin Co.: 4 May 1962, *Lakela* s.n. (FTG); flat open pineland, grassy, with *Sabal palmetto*, *Serenoa repens*, *Befaria* & *Lyonia*, N of Port Salerno, off US A1A, 4 May 1962, *Lakela* 25033 (ENP, FTG); dry area near Pinegrove Campground, Johnathan Dickenson State Park, 17 May 1975, *Popenoe* 358 (FTG). Palm Beach Co.: in open pineland along Indiantown Road, SR 706, about 1 mi E of Jupiter exit on turnpike, 7 Feb 1975, *Correll & Popenoe* 44271 (FTG); growing on road shoulder, Donald Ross Rd, approx. 1 km E of SR 811, 28 Jul 1984, *Herndon* 1091 (FLAS, FTG, US); growing on road shoulder, Hood Road approx. 3 km W of SR 811, 28 Jul 1984, *Herndon* 1092 (FTG); growing on road shoulder, PGA Blvd at Loxahatchee Slough, 28 Jul 1984, *Herndon* 1093 (FTG, US).

Apparently first found by O. Lakela ca 1962. Status as a native questionable. Known from Martin and Palm Beach counties in Florida.

### ACKNOWLEDGMENTS

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